meaning; the class *Gymnospermæ* is given on one page as of superior value to *Incompletæ*, on another as included within it; and it is difficult to understand how the terms "loculicidal" and "septicidal" can be applied with propriety to a mono-carpellary capsule like that of the primrose. The statement that "the tables on classification have been compiled from Dr. Hooker's 'Student's Flora of the British Islands'" is rather misleading, when we find, on p. 14, the Gamopetalous orders with inferior ovary included in "Calycifloræ." But defects of this sort are incidental to any attempt of the kind. Dr. Aveling may be congratulated on the success of his effort, if it be not of a very high order.

Vergleichende Untersuchungen über den Bau der Vegetationsorgane der Monocotyledonen. Von Dr. P. Falkenberg. Mit drei Tafeln. (Stuttgart: F. Enke, 1876.)

OUR knowledge of the anatomical structure of the stem of Monocotyledons has hitherto been pretty much confined to that of palms, and has been founded to a great extent on the researches of Mohl and Mirbel. It has hence been assumed, perhaps somewhat rashly, that the type of structure is far more uniform in the stem of Monocotyledons than of Dicotyledons. For the purpose of investigating this point Dr. Falkenberg has submitted to very careful examination the stem of one or more species belonging to as many as seventeen orders or sub-orders of Monocotyledons, and shows that our previous conceptions must be modified in several respects. The stem of Monocotyledons, he states, is divided into an inner central cylinder and an outer cortical layer by a separating sheath which is developed in some cases from the internal, in other cases from the external tissue. As regards the course of the fibrovascular bundles in the central cylinder, and the degree to which they are differentiated from the fundamental tissue, he finds three different types of structure. Perhaps the most important correction of ideas previously accepted is his complete refutation of the statement found in so many text-books, that Monocotyledons have none but adventitious roots. Dr. Falkenberg asserts that the existence of a normal tap-root is general in Monocotyledons, with the exception of those that are altogether destitute of a root. The adventitious roots which subsequently, in many cases, supplant the original tap-root, do not differ from it in an anatomical point of view. A. W. B.

Jenkinson's Practical Guide to the Isle of Wight. By Henry Irwin Jenkinson, F.R.G.S., &c. Also Smaller Practical Guide. (London: Stanford, 1876.)

MR. JENKINSON, by his practical guides to the Lake District, Carlisle, and the Roman Wall, has already proved himself possessed of a rare faculty for the work of guide-book making. The handy volumes before us are quite equal to those previously published. The "Guide to the Isle of Wight" is evidently the result of conscientious work and minute painstaking; the author has gone over all the ground described, and made himself well acquainted with all the historical and antiquarian knowledge which adds interest to the various places referred to. The introduction to the larger "Guide," covering upwards of eighty pages, contains a *résumé* of the scientific knowledge which bears on the island—its geology, its flora, and its fauna. This part seems to us carefully and accurately compiled, and by the scientific visitor will be considered a valuable addition to the volume. Mr. Jenkinson divides the text of his "Guide" into six sections, grouped round the chief towns of the island, each section being accompanied by a full and clear and carefully executed map. Altogether Mr. Jenkinson's "Guide" is a thoroughly good, and we believe trustworthy, one; and while it deserves the title "practical," and will be of the greatest use to the visitor, the general reader might read it through with interest and profit.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

A Science Museum

THE fact that the Science and Art Department have had before them for at least ten years the proposal to establish a science museum, is shown conclusively enough in NATURE for last week. May I be allowed to draw attention to a still earlier suggestion of the same character? As far back as 1859, two years after the establishment of the Patent Office Museum, the Commissioners of Patents laid a Report before Parliament, in which the following passage occurs:—

"It is intended to make the Patent Office Museum an historical and educational institution for the benefit and instruction of the skilled workmen employed in the various factories of the kingdom, a class which largely contributes to the surplus fund of the Patent Office in fees paid upon patents granted for their valuable inventions. Exact models of machinery in subjects and series of subjects, showing the progressive steps of improvement in the machines for each branch of manufacture, are to be exhibited; for example, it is intended to show in series of exact models each important invention and improvement in steam propellers [steam-boat propulsion] from the first engine that drove a boat of two tons burden to the gigantic machinery of the present day, propelling the first-rate ship of war or of commerce. The original small experimental engine that drove the boat of two tons burden, above referred to, is now in the museum, and is numbered one in the series of models of propellers."

Unhappily this brilliant project rested unfulfilled. "No. 1" of the series of models of steamboat propellers had but few followers, while other branches of mechanical science did not get so far as to have even a "No. 1." The conception was excellent, the execution lamentably deficient. Thus the collection which was to have expanded into a museum of mechanical and industrial science degenerated into an old lumber-room, and, instead of expanding over the ground originally allotted to it, contracted into its present dimensions.

Into the causes of this failure there is no need to enter. The thing has failed, and there is an end of it. Luckily there is a chance of something better now, and it is to be hoped that we shall soon have the collection belonging to the Patent Office divided into two parts—one part to be sent to the Science Museum, and the other to the nearest dust-heap. So long as it belongs to the Patent Office, the aggregation of rubbish will be sure to continue. The Commissioners have never exercised a power of selection, and any foolish invention, so that it is only the subject of a patent, has the right of *entrée*. Naturally it is not the important inventions which make their appearance at South Kensington. As part of a Patent Office, a museum is practically worthless. It is hardly possible to imagine an invention which—at least to an expert—cannot be as clearly explained by descriptions and drawings as by a model. For purposes of experiment and instruction models are obviously invaluable. By no other means, for instance, can *motion* be rendered intelligible to a class of students or a popular audience. When the object, however, is simply to define what an inventor has discovered or constructed, so that it can be understood by an expert, a drawing and a description are nearly always much better—always as good—as any model. The only reason why the Patent Office should have charge of such a museum is that the officials of the office are in constant communication with the particular class likely to contribute to the museum. Patent cases are fruitful in models, constructed, not for the engineers, but to enable the engineers to explain to those who have no special mechanical knowledge the action of the different apparatus before them. Many such models are of no public interest, but many are well worth preservation, and it was thought that from these and like sources the Patent Office Museum would soon grow rich. The event has hardly justified the hope, but that is no reason why, under better management, the promises held out fifteen years ago should not now be realised. With all its deficiencies, the Patent Office Museum has done one good service. It has preserved some quite invaluable examples of early mechanical science which would otherwise have been scattered to the four winds—most of them to the west wind and the States. These are ready to form the best possible foundation for the mechanical section of the Science Museum, a section

which, in a great manufacturing country like this, ought certainly not to be the least important of all. H. T. WOOD.

Society of Arts, Aug. 22

The Diurnal Inequalities of the Barometer

LIKE the author of the interesting paper on the daily inequalities of the barometer in NATURE, vol. xiv. p. 314, I am one of those who are waiting for the appearance of the second part of Mr. Buchan's essay on this subject. Perhaps the coming meeting of the British Association at Glasgow may elicit from Mr. Buchan the result of his laborious investigations. I own that I am not only anxious to ascertain if his views coincide with my own,[1] but desire very much to have at my command the thorough discussion of the data for the eighty-six stations which Mr. Buchan has collected.

So far as a correct explanation of the inequalities is concerned, I believe it must be one that can dispense with the lateral movements of the air proposed by Mr. Blanford, and be applicable alike during the calm days of the "doldrums," and during periods of great wind disturbance. It must explain, too, seasonal differences in their amount, and we may infer that what will explain a seasonal difference will probably explain also a geographical difference of the same kind.

In the barometric co-efficients for Calcutta, supplied by Mr. Blanford, the semicircular one U' is nearly twice as great in April as it is in July, and the quadrantal co-efficient U'' is one third greater in March than it is in June. The hour angle u' does not vary so much as it does in this country, and the angle u'' shows its usual very remarkable constancy. In England the co-efficient U'' seems to have a greater proportionate range than at Calcutta. This will be seen by the following monthly means obtained from Mr. Main's discussion of the observations made at the Radcliffe Observatory, Oxford.

Mean Daily Quadrantal Oscillation of the Barometer for each month at Oxford for the sixteen years, 1858-1873 inclusive. In units of ·0001 of an inch :—

March	120	September	120
April	118	October	109
May	101	November	90
June	98	December	92
July	94	January	74
August	108	February	111

The epochs of maximum effect seem here to correspond with the greatest thermometric range rather than with epochs of greatest heat. I think it will also be found in this country that this inequality is as large, if not larger, during continuous strong westerly winds as during quiet anticyclonic periods.

Like Mr. Blanford I was led to this subject by a study of the daily inequalities of the wind. My having arrived at a very different result must be my excuse for pointing out what seem to me to be points of difference between the conditions which he theoretically investigates and those which exist in nature. Mr. Blanford shows that "when a given quantity of heat is employed in heating dry air at the temperature of 80°, it raises its pressure more than seven times as much as when it simply charges it with vapour without altering the temperature." Mr. Blanford very properly premises that this occurs "while the volume remains constant." It is also implied that the volumes of air are of equal tension throughout. But where do these conditions obtain in volumes of the atmosphere? Such a volume, for example, as rests on a square yard, a square mile, or a hundred square miles of the earth's surface. This volume may easily be supposed to remain perfectly constant, while the tension of its parts may vary enormously. No ordinary addition of heat to the base of this volume will increase its total weight or sensibly add to the tension of the air at the surface of the earth. The added heat will alter the relative tension of portions of the lower third or half of the volume, and will be expended in raising to a small extent the centre of gravity of the whole. When this is done, that is, when the dynamical effect of the added heat is completed, the barometer at the base of the volume of the atmosphere will in reality read a little lower, instead of showing the greater tension required by Mr. Blanford's investigation. And this will be the case whether the added heat has expanded dry air only, or has evaporated particles of water already in the atmosphere. In either case I apprehend that during the upward movement of the warm air or of the *lighter* vapour the barometer would read lower than at the moment when the movement was completed.

An elevation of the centre of gravity of the atmosphere equal to two-thirds of a mile, barometer at 30 inches, would reduce the weight of the atmosphere by about the one-hundredth of an inch. The centre of gravity of the air over an elevated station like Leh in Ladakh would have to be raised several miles to produce so large a change of pressure as ·1034 of an inch, the difference between the maximum night and day value of co-efficient U' as given by Mr. Blanford—so many miles as, in my opinion, to compel one to look for some other cause for the production of part of the observed effect, and that cause, I believe, will be found in the dynamical one already indicated.

W. W. RUNDELL

[1] On the Diurnal Inequalities of the Barometer and Thermometer. *Quarterly Journal of the Meteorological Society*, Oct., 1874

Visual Phenomena

ALTHOUGH most people are familiar with the appearances which surround, or perhaps I should say form, the image on the retina of a luminous point, their origin, I believe, is not so generally known, and it is not uncommon to hear them ascribed to reflection from the eyelids and eyelashes, which in reality plays no part in their production. There are three distinct phenomena which go to make up the appearance of a luminous point, but they are not generally all visible at once. I will describe them for convenience of reference as phenomena A, B, and C.

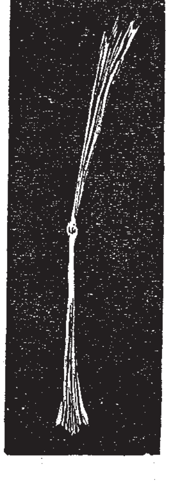
(A). The luminous point appears to be surrounded by short rays, seldom more than a degree in length, generally much less, the length depending on the brightness of the point and the size of the pupil at the time.

These rays are what make a bright point look star-shaped (Fig. 1).

(B). Upwards and downwards from the point proceed two bundles of rays, each often 20° or more in length, and inclined to one another at an obtuse angle (Fig. 2).

Fig. 1.

Fig. 2



(C). Coloured rays such as are shown in Fig. 3, which are only seen when the eyelids are nearly closed.

These perhaps it is hardly necessary to say are produced by diffraction through the eyelashes.

(B) is due to refraction through the small band of tears, which is retained by capillarity in the angle between the inner edge of the eyelid and the eye (shown at t and t', Fig. 4), and which acts as a curved prism, although its effect is only visible when the lids are advanced far enough over the cornea to allow light which passes close to them to enter the pupil.

The following simple experiments show that this explanation is the right one.

1. While looking at a bright point so as to see (B), draw down the lower eyelid, the upper bundle of rays will then disappear. This shows that the upper rays are caused by the lower eyelid, and also that as the image on the retina is inverted, the light must take some such course as shown by the dotted lines in Fig. 5. Now in no conceivable way could reflection from the